

**Listing of Claims:**

1. (Thrice Amended) A semiconductor optical amplifier comprising:
- a first mirror disposed on a substrate;
  - an active region consisting of an optical cavity having gain medium, said optical cavity being disposed adjacent said first mirror;
  - a second mirror disposed on said active region on a surface opposite said first mirror;
  - input and output portions formed in said mirrors, said input and output portions having formed layers of reduced reflectivity relative to a corresponding first or second mirror; and
  - a longitudinal waveguide integral to said optical cavity connecting input and output ports, whereby said longitudinal waveguide is configured with a downward step in reflectivity at said input and output ports of the optical amplifier.

**~~Claims 2-5 have been REINSTATED AND ALLOWED~~**

2. (Original) The semiconductor optical amplifier of claim 1, whereas said gain medium is electrically or optically pumped.
3. (Amended) The semiconductor optical amplifier of claim 1, whereas [the] said input and output ports lie on the same sides of [the] a vertical structure of the optical amplifier.

4. (Amended) The semiconductor optical amplifier of claim 1, whereas [the] said input and output ports lie on opposite sides of [the] a vertical structure of the optical amplifier.

5. (Original) The semiconductor optical amplifier of claim 1, whereas said first and second mirrors consist of distributed Bragg reflectors from the group of a series of high and low index lattice-matched or metamorphic semiconductor layers disposed on either of said substrate or said first mirror by epitaxial growth.

6. (Original) The semiconductor optical amplifier of claim 1, whereas said second mirror consists of a distributed Bragg reflector from the group of a series of high and low index dielectric layers disposed on said first mirror by non-epitaxial growth.

**Claims 7-9 have been REINSTATED AND ALLOWED**

7. (Amended) The semiconductor optical amplifier of claim 1, whereas said longitudinal waveguide is gain/loss modulated in [the] a lateral direction of the optical amplifier.

8. (Amended) The semiconductor optical amplifier of claim 1, whereas said longitudinal waveguide is index modulated in [the] a lateral direction of the optical amplifier.

9. (Amended) The semiconductor optical amplifier of claim 1 whereas said first mirror, said optical cavity with gain material, and said second mirror are composed of lattice-matched semiconductor material, whereby and said longitudinal waveguide is formed by an either etch and regrowth or a ridge waveguide technique.

10. (Original) The semiconductor optical amplifier of claim 1 whereas said first mirror and said optical cavity with gain material are composed of lattice-matched semiconductor material, said second mirror is composed of different lattice matched metamorphic semiconductor material, and said longitudinal waveguide is formed by etch and oxidation of said metamorphic material.

**Claims 11-12 have been REINSTATED AND ALLOWED**

11. (Amended) The semiconductor optical amplifier of claim 1 whereas said first mirror and said optical cavity with gain material are composed of lattice-matched semiconductor material, said second mirror is composed of dielectric material, and said longitudinal waveguide is formed [via] by [the] an effective index waveguide technique.

12. (Amended) The semiconductor optical amplifier of claim 2 whereas said optical pumping is provided by a monolithically grown vertical cavity laser (VCL) structure that is wafer-fused to [said] the semiconductor optical amplifier (SOA) structure.

**Claims 13-16 are CANCELLED.**

Listing of Claims:

1. (Twice Amended) A semiconductor optical amplifier comprising:

a first mirror disposed on a substrate;

an active region consisting of an optical cavity having gain medium, said optical cavity being disposed adjacent said first mirror;

a second mirror disposed on said active region on a surface opposite said first mirror;

input and output portions formed in said mirrors, said input and output portions having formed layers of reduced reflectivity relative to a corresponding first or second mirror; and

a longitudinal waveguide integral to said optical cavity connecting [said] input and output ports, whereby said longitudinal waveguide is configured with a downward step in reflectivity at input and output ports of the optical amplifier.

Claims 2-5 are withdrawn

6. (Original) The semiconductor optical amplifier of claim 1, whereas said second mirror consists of a distributed Bragg reflector from the group of a series of high and low index dielectric layers disposed on said first mirror by non-epitaxial growth.

Claims 7-9 are withdrawn.

10. (Original) The semiconductor optical amplifier of claim 1 whereas said first mirror and said optical cavity with gain material are composed of lattice-matched semiconductor material, said second mirror is composed of different lattice

matched metamorphic semiconductor material, and said longitudinal waveguide is formed by etch and oxidation of said metamorphic material.

Claims 11-16 are withdrawn.

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